

Application No. 09/375,906
Amendment D dated October 28, 2003

7/20

AMENDMENTS TO THE CLAIMS

The listing of claims will replace all prior versions, and listings, of claims in the application:

Claims 1-16. (Cancelled)

17. (New) A channel estimation unit for obtaining channel estimates of data symbols from pilot symbols in a combined symbol sequence which has a plurality of slots and includes the data symbols and the pilot symbols, said channel estimation unit comprising:

means for locating the pilot symbols in the combined symbol sequence;

means for generating pilot blocks by extracting the pilot symbols from two or more slots in the combined symbol sequence in accordance with a located result; and

means for obtaining the channel estimates of the data symbols by calculating a weighted sum of averages of the pilot symbols in the individual pilot blocks,

wherein a magnitude of weighting differs between at least two data symbols in each slot, and when obtaining the channel estimates of the data symbols in an n th slot in the combined symbol sequence, where n is an integer, the pilot blocks are generated from $(n-K+1)$ th slot to $(n+K)$ th slot in the combined symbol sequence, where K is a natural number.

18. (New) A channel estimation method of obtaining channel estimates of data symbols from pilot symbols in a combined symbol sequence which has a plurality of slots and includes the data symbols and the pilot symbols, said channel estimation method comprising the steps of:

locating the pilot symbols in the combined symbol sequence;

generating pilot blocks by extracting the pilot symbols from two or more slots in the combined symbol sequence in accordance with a located result; and

obtaining the channel estimates of the data symbols by calculating a weighted sum of averages of the pilot symbols in the individual pilot blocks, wherein a magnitude of weighting differs between at least two data symbols in each slot, and when obtaining the channel estimates of the data symbols in an n th slot in the combined symbol sequence, where n is an integer, the

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pilot blocks are generated from $(n-K+1)$ th slot to $(n+K)$ th slot in the combined symbol sequence, where K is a natural number.

3 19. (New) A channel estimation unit for obtaining channel estimates of data symbols from pilot symbols in a combined symbol sequence which has a plurality of slots and includes the data symbols and the pilot symbols, said channel estimation unit comprising:

means for locating the pilot symbols in the combined symbol sequence;
 means for generating pilot blocks by extracting the pilot symbols from two or more slots in the combined symbol sequence in accordance with a located result;
 means for obtaining the channel estimates of the data symbols by calculating a weighted sum of averages of the pilot symbols in the individual pilot blocks,

wherein a magnitude of weighting differs between at least two data symbols in each slot and the power of the data symbols and pilot symbols is controlled on a slot by slot basis.

4 20. (New) A CDMA receiver which receives a combined symbol sequence that is spread, has a plurality of slots, and includes data symbols and pilot symbols, and which generates a data sequence, said CDMA receiver comprising:

means for receiving the spread combined symbol sequence;
 means for generating a combined symbol sequence by despread the spread combined symbol sequence;
 means for locating the pilot symbols in the combined symbol sequence;
 means for generating pilot blocks by extracting the pilot symbols from two or more slots in the combined symbol sequence in accordance with a located result;
 means for obtaining channel estimates of the data symbols by calculating a weighted sum of averages of the pilot symbols in the individual pilot blocks;
 means for obtaining a data symbol sequence by eliminating the pilot symbols from the combined symbol sequence in accordance with the located result;
 means for compensating for channel fluctuations in the data symbol sequence by using the channel estimates of the data symbols; and
 means for generating the data sequence by demodulating the data symbol sequence compensated for,

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wherein a magnitude of weighting differs between at least two data symbols in each slot.

5 21. (New) A CDMA transceiver including a transmitting processor and a receiving processor, said transmitting processor comprising:

means for generating a data symbol sequence by modulating a data sequence;

means for generating a combined symbol sequence by inserting pilot symbols into the data symbol sequence;

means for generating a spread combined symbol sequence by spreading the combined symbol sequence; and

means for transmitting the spread combined symbol sequence,

wherein the spread combined symbol sequence to be transmitted has a plurality of slots, and said receiving processor comprising:

means for receiving the spread combined symbol sequence;

means for generating the combined symbol sequence by de spreading the spread combined symbol sequence;

means for locating the pilot symbols in the combined symbol sequence;

means for generating pilot blocks by extracting the pilot symbols from two or more slots in the combined symbol sequence in accordance with a located result;

means for obtaining channel estimates of the data symbols by calculating a weighted sum of averages of the pilot symbols in the individual pilot blocks;

means for obtaining a data symbol sequence by eliminating the pilot symbols from the combined symbol sequence in accordance with the located result;

means for compensating for channel fluctuations in the data symbol sequence by using the channel estimates of the data symbols; and

means for generating the data sequence by demodulating the data symbol sequence compensated for,

wherein a magnitude of weighting differs between at least two data symbols in each slot.

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6 ~~22~~. (New) The CDMA transceiver as claimed in claim ⁵~~21~~, wherein said transmitting processor further comprises means for inserting into the data symbol sequence a power control symbol sequence for controlling power of the data symbols and pilot symbols.

7 ~~23~~. (New) The CDMA transceiver as claimed in claim ⁶~~22~~, wherein said receiving processor further comprises means for measuring from the pilot symbols a signal-to-noise and interference power ratio, and for generating the power control symbol sequence from the signal-to-noise and interference power ratio.

8 ~~24~~. (New) The CDMA transceiver as claimed in claim ⁵~~21~~, wherein said receiving processor further comprises means for extracting, from the data symbol sequence compensated for, the power control symbol sequence for controlling power of the data symbols and pilot symbols, and said means for transmitting the spread combined symbol sequence transmits the spread combined symbol sequence in accordance with the power control symbol sequence.

9 ~~25~~. (New) The equipment as claimed in any one of claims ^{1 4 5}~~17, 20 and 21~~, wherein the power of the data symbols and pilot symbols is controlled on a slot by slot basis.

10 ~~26~~. (New) The equipment as claimed in any one of claims ^{1 3-5}~~17 and 19-21~~, wherein the number of data symbols included in each slot of the combined symbol sequence is the same, and the number of pilot symbols included in each slot of the combined symbol sequence is the same.

11 ~~27~~. (New) The equipment as claimed in any one of claims ^{1 3-5}~~17 and 19-21~~, wherein the pilot blocks each consist of all the pilot symbols in each slot.

12 ~~28~~. (New) The equipment as claimed in any one of claims ³⁻⁵~~19-21~~, wherein when obtaining the channel estimates of the data symbols in an nth slot in the combined symbol sequence, where n is an integer, the pilot blocks are generated from (n-K+1)th slot to (n+K)th slot in the combined symbol sequence, where K is a natural number.

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13 ~~20~~. (New) The equipment as claimed in any one of claims ~~17~~ and ~~19-21~~, wherein the pilot blocks closer to the data symbol with which the channel estimate is to be obtained have greater weight.

14 ~~30~~. (New) A channel estimation method of obtaining channel estimates of data symbols from pilot symbols in a combined symbol sequence which has a plurality of slots and includes the data symbols and the pilot symbols, said channel estimation method comprising the steps of:

- locating the pilot symbols in the combined symbol sequence;
 - generating pilot blocks by extracting the pilot symbols from two or more slots in the combined symbol sequence in accordance with a located result; and
 - obtaining the channel estimates of the data symbols by calculating a weighted sum of averages of the pilot symbols in the individual pilot blocks,
- wherein a magnitude of weighting differs between at least two data symbols in each slot, and the power of the data symbols and pilot symbols is controlled on a slot by slot basis.

15 ~~31~~. (New) A CDMA receiving method of generating a data sequence by receiving a combined symbol sequence that has a plurality of slots, includes data symbols and pilot symbols, and is spread, said CDMA receiving method comprising the steps of:

- receiving the spread combined symbol sequence;
- generating the combined symbol sequence by despread the spread combined symbol sequence;
- locating the pilot symbols in the combined symbol sequence;
- generating pilot blocks by extracting the pilot symbols from two or more slots in the combined symbol sequence in accordance with a located result;
- obtaining channel estimates of the data symbols by calculating a weighted sum of averages of the pilot symbols in the individual pilot blocks;
- obtaining a data symbol sequence by eliminating the pilot symbols from the combined symbol sequence in accordance with the located result;
- compensating for channel fluctuations in the data symbol sequence by using the channel estimates of the data symbols; and

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generating the data sequence by demodulating the data symbol sequence compensated for,

wherein a magnitude of weighting differs between at least two data symbols in each slot.

- 16 32. (New) A CDMA transmitting and receiving method comprising the steps of:
- on a transmitting side,
 - generating a data symbol sequence by modulating a data sequence;
 - generating a combined symbol sequence by inserting pilot symbols into the data symbol sequence;
 - generating a spread combined symbol sequence by spreading the combined symbol sequence; and
 - transmitting the spread combined symbol sequence,
 - wherein the spread combined symbol sequence to be transmitted has a plurality of slots, and
 - on a receiving side,
 - receiving the spread combined symbol sequence;
 - generating the combined symbol sequence by despreading the spread combined symbol sequence;
 - locating the pilot symbols in the combined symbol sequence;
 - generating pilot blocks by extracting the pilot symbols from two or more slots in the combined symbol sequence in accordance with a located result;
 - obtaining channel estimates of the data symbols by calculating a weighted sum of averages of the pilot symbols in the individual pilot blocks;
 - obtaining a data symbol sequence by eliminating the pilot symbols from the combined symbol sequence in accordance with the located result;
 - compensating for channel fluctuations in the data symbol sequence by using the channel estimates of the data symbols; and
 - generating the data sequence by demodulating the data symbol sequence compensated for,

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wherein a magnitude of weighting differs between at least two data symbols in each slot.